

# QUATECH

## QSC(LP)-200/300

Four Channel RS-422/485 Asynchronous  
Communications Adapter

for PCI bus

### User's Manual

QUATECH, INC.  
5675 Hudson Industrial Parkway  
Hudson, Ohio 44236

TEL: (330) 655-9000  
FAX: (330) 655-9010  
<http://www.quatech.com>

## WARRANTY INFORMATION

Quatech, Inc. warrants the **QSC(LP)-200/300** to be free of defects for **five (5) years** from the date of purchase. Quatech, Inc. will repair or replace any board that fails to perform under normal operating conditions and in accordance with the procedures outlined in this document during the warranty period. Any damage that results from improper installation, operation, or general misuse voids all warranty rights.

Please complete the following information and retain for your records. Have this information available when requesting warranty service.

DATE OF PURCHASE:

MODEL NUMBER: QSC(LP)-200/300

PRODUCT DESCRIPTION: Four Channel RS-422/485 Asynchronous  
PCI Bus Communications Adapter

SERIAL NUMBER:

© 1998 - 2006, Quatech, Inc.

### NOTICE

The information contained in this document cannot be reproduced in any form without the written consent of Quatech, Inc. Likewise, any software programs that might accompany this document can be used only in accordance with any license agreement(s) between the purchaser and Quatech, Inc. Quatech Inc. reserves the right to change this documentation or the product to which it refers at any time and without notice.

The authors have taken due care in the preparation of this document and every attempt has been made to ensure its accuracy and completeness. In no event will Quatech, Inc. be liable for damages of any kind, incidental or consequential, in regard to or arising out of the performance or form of the materials presented in this document or any software programs that might accompany this document.

Quatech, Inc. encourages feedback about this document. Please send any written comments to the Technical Support department at the address listed on the cover page of this document.

DOS, Windows ME, Windows 2000, Windows 98, Windows 95, Windows NT are trademarks or registered trademarks of Microsoft Corporation. OS/2 is a registered trademark of IBM Corporation. All other trademarks or registered trademarks are property of their respective owners.

## Declaration of Conformity

**Manufacturer's Name:** Quatech Inc.

**Manufacturer's Address:** 5675 Hudson Industrial Parkway  
Hudson, Ohio 44236 (USA)

**Application of Council Directive:** 89/336/EEC

**Standards to which  
Conformity is Declared:** \* EN50081-1 (EN55022,  
EN60555-2, EN60555-3)  
\* EN50082-1 (IEC 801-2,  
IEC 801-3, & IEC 801-4)

**Type of Equipment:** Information Technology  
Equipment

**Equipment Class:** Commercial, Residential, & Light  
Industrial

**Product Name:** PCI Quad Serial Communications  
Card

**Model Number :** QSC(LP)-200/300 (IND)

.....	1
<b>1 General Information</b> .....	5
1.1 Features .....	5
1.1.1 "IND" Option --- Surge Suppression Upgrade .....	5
<b>2 Hardware Configuration</b> .....	6
2.1 Signal Connections .....	6
2.1.1 AUX(1,2,3,4) (pins 3 and 4, 7 and 8, 11 and 12, 15 and 16) .....	6
2.1.2 TGL(1,2,3,4) (pins 1 and 2, 5 and 6, 9 and 10, 13 and 14) .....	6
2.1.3 Force High-Speed UART Clock (X8, pins 17 and 18) .....	7
<b>3 Hardware Installation</b> .....	8
<b>Windows Configuration</b> .....	9
4.1 Windows Millennium .....	9
4.2 Windows 2000 .....	10
4.3 Windows 98 .....	11
4.4 Windows 1995 .....	13
4.5 Windows NT .....	14
4.6 Viewing Resources with Device Manager .....	15
4.6.1 Changing Resource Settings with Device Manager .....	17
<b>5 Other Operating Systems</b> .....	21
5.1 Windows NT .....	21
5.2 OS/2 .....	21
5.3 DOS and other operating systems .....	21
5.3.1 QTPCI.EXE .....	22
<b>6 External Connections</b> .....	24
6.1 DTR/DSR or RTS/CTS Operation .....	24
6.2 RTS/cts Handshake .....	24
6.3 RCLK .....	24
6.4 TCLK .....	24
6.5 AUXIN/AUXOUT Loopback .....	25
6.6 Half-Duplex/Full-Duplex/Auto-Toggle Selection .....	25
Termination Resistors .....	26
6.8 RS-422/485 Peripheral Connection .....	27
6.9 RS-422/485 Peripheral Connection .....	28
<b>7 PCI Resource Map</b> .....	29

<b>Base Address and Interrupt Level (IRQ)</b> .....	29
<b>8 Specifications</b> .....	30
<hr/>	
<b>9 Troubleshooting</b> .....	31
<hr/>	

# 1 General Information

---

The Quatech, Inc. QSC(LP)-200/300 provides four RS-422 or RS-485 asynchronous serial communication interfaces for IBM-compatible personal computer systems using the PCI expansion bus. The QSC(LP)-200/300 uses Quatech's new Enhanced Serial Adapter design. Legacy serial port data rates are limited to a maximum of 115,200 bits per second. Quatech Enhanced Serial Adapters can achieve data rates as high as 921,600 bits per second.

As a PCI device, the QSC(LP)-200/300 requires no hardware configuration. The card is automatically configured by the computer's BIOS or operating system. The four serial ports share a single interrupt line and are addressed in a contiguous block of 32 bytes. A special interrupt status register is provided to help software to manage the shared interrupt.

The QSC(LP)-200/300's serial ports use 16750 Universal Asynchronous Receiver/Transmitters (UARTs). These UARTs contain hardware buffers (FIFOs) which reduce processing overhead and allow higher data rates to be achieved. The 16750 contains a 16-byte FIFO and can transmit and receive data at a rate of up to 921,600 bits per second. The 16750 is recommended for heavy multitasking environments and for applications involving high data rates.

The QSC(LP)-200/300 is supported under several popular operating systems and environments. Contact the sales department for details on current software offerings. Most device drivers are available for download from the Quatech world wide web site at <http://www.quatech.com>.

## 1.1 Features

The standard QSC(LP)-200/300 implements each of its communication channels with a 16750 UART and uses standard line driver and receiver components. For improved performance and industrial-grade reliability, Quatech offers the following board upgrades:

### 1.1.1 "IND" Option --- Surge Suppression Upgrade

The "IND" option provides the protection essential for reliable use in an industrial environment. Each communication line has a surge suppressor capable of sustaining up to 40A 20us peak transient surges, a clamping voltage of 30V and a peak energy dissipation of 0.1 Joules.

Part Number	IND Option
QSC(LP)-200/300	no
QSC(LP)-200/300IND	yes

Figure 1 --- QSC(LP)-200/300 Product Series Summary

## 2 Hardware Configuration

---

The QSC(LP)-200/300 is automatically configured at boot time by the computer's BIOS or operating system. There are no required switches or jumpers to set for installation.

This chapter lists a number of optional jumper settings that control various hardware features. These jumpers, located in a row along the top of the board, control how signals are routed from the UARTs to the connector, as well as special options.

Any changes from the factory default should be made before installing the QSC(LP)-200/300 in the computer. These settings can also be changed in Device Manager under Windows operating systems.

### 2.1 Signal Connections

The QSC(LP)-200/300 provides each of four serial ports with four differential signal pairs: TxD, RxD, AUXOUT, and AUXIN. TxD and RxD are always present at the connector. The AUXOUT and AUXIN signals can be used to support RTS/CTS handshaking, external clocking, or external signal loopback. The factory default configuration, as shown in Figure 2 with no jumpers across any of the pins, is a loopback of AUXOUT to AUXIN at the connector, with RTS and CTS looped back on the board. There is an extensive discussion of this topic in section 6.

**Jumper J1 defines the options for this card:**

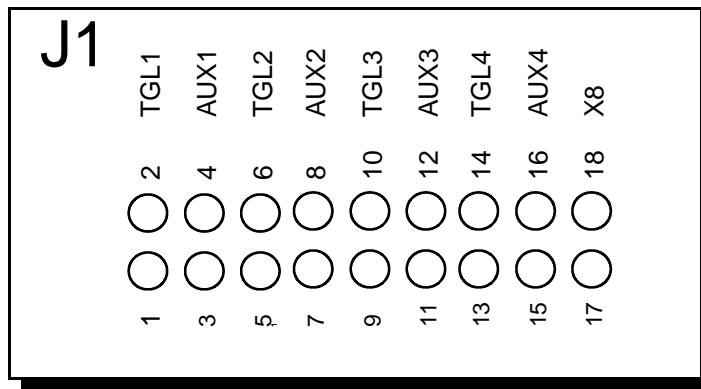


Figure 2 - Top Card Edge Jumpers

#### 2.1.1 AUX(1,2,3,4) (pins 3 and 4, 7 and 8, 11 and 12, 15 and 16)

The 1, 2, 3, or 4 will designate which port the settings will be applied to. With NO jumpers across the “AUX” pins, CTS = RTS and AUXIN = AUXOUT. With a jumper on any of the “AUX” pins, CTS = AUXIN and AUXOUT = RTS for the given port.

#### 2.1.2 TGL(1,2,3,4) (pins 1 and 2, 5 and 6, 9 and 10, 13 and 14)

The 1, 2, 3, or 4 will designate which port the settings will be applied to. With NO jumpers across the “TGL” pins, TXEN = 1. With a jumper on any of the “TGL” pins, TXEN will be set to “Auto-Toggle” for the given port.



### **2.1.3 Force High-Speed UART Clock (X8, pins 17 and 18)**

This jumper forces an increase of the UART input clock frequency by a factor of eight. This feature can allow legacy software to use baud rates above 115,200 bits per second. It is also useful if the serial port device driver does not directly support setting the higher baud rates through the Options Register.

If this jumper is applied, it overrides any value written to the Options Register to set the clock multiplier by software. The effective baud rate will be eight times the value for which the UART itself is programmed. If selected, the clock multiplier will be applied to all ports on the card, it is not possible to selectively apply the clock multiplier to a specific port.

The factory default is no jumper applied, which allows for software control of the clock multiplier via the Options Register. The Options Register powerup default is for a standard times-1 clock of 1.8432 MHz for compatibility with standard serial ports.

### 3 Hardware Installation

---

1. Turn off the power of the computer system in which the QSC(LP)-200/300 is to be installed.
2. Remove the system cover according to the instructions provided by the computer manufacturer.
3. Make any desired optional jumper setting changes.
4. Install the QSC(LP)-200/300 in any empty PCI expansion slot. The board should be secured by installing the Option Retaining Bracket (ORB) screw.
5. Replace the system cover according to the instructions provided by the computer manufacturer.
6. Attach and secure the cable connectors to the desired equipment.
7. Turn on the power of the computer system.

The output of the QSC(LP)-200/300 is a 44-pin custom connector, which is brought out to four 9-pin D-connectors via a custom cable.

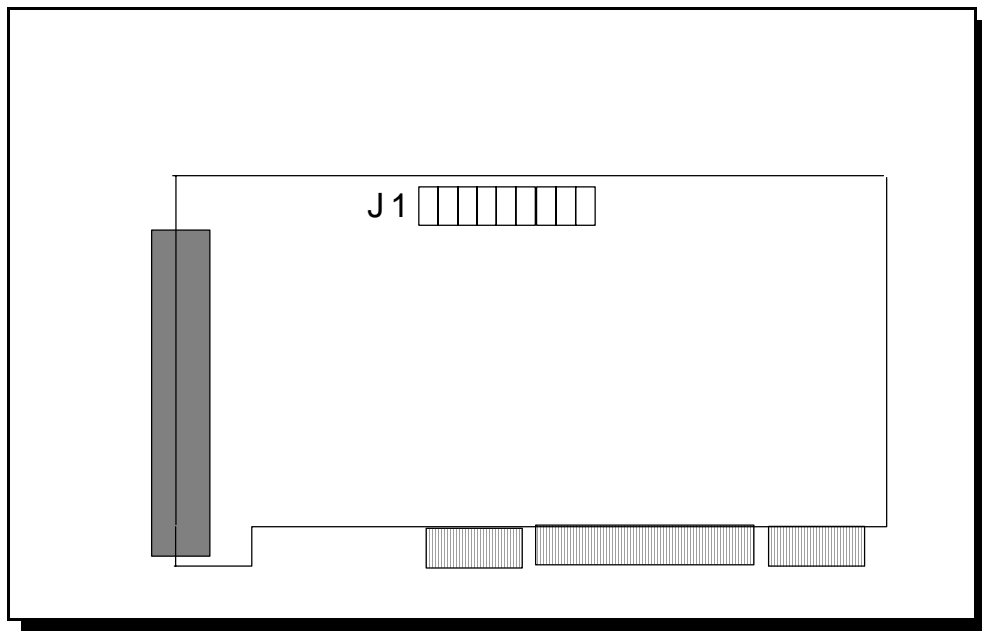


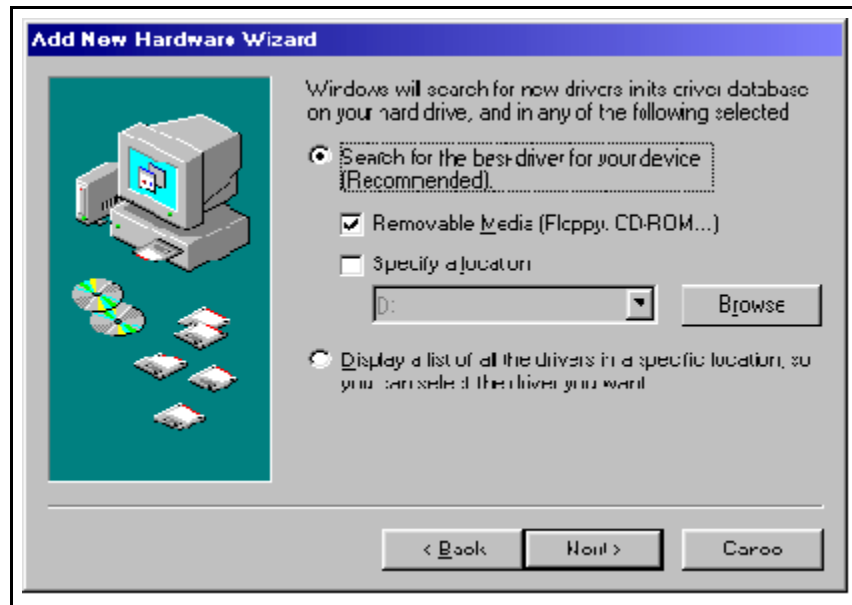
Figure 3 --- Jumper/connector locations

## 4 Windows Configuration

---

### 4.1 Windows Millennium

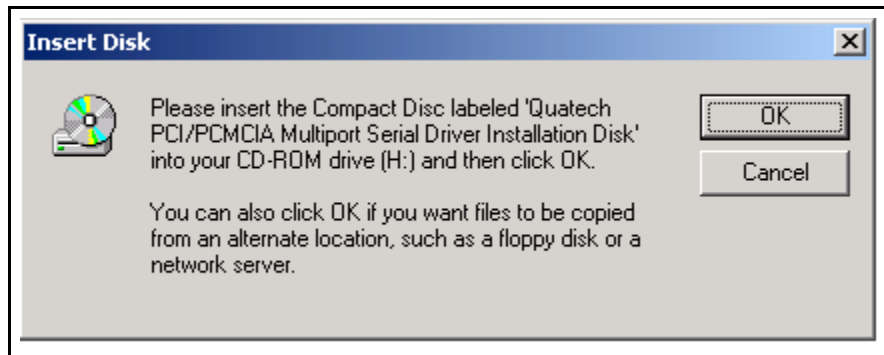
1. After inserting the QSC(LP)-200/300 for the first time the "Add New Hardware Wizard" will begin. Select "Search for the best driver for your device.". Check the "Removable media" and "Specify location" box. Click the "Next" button.



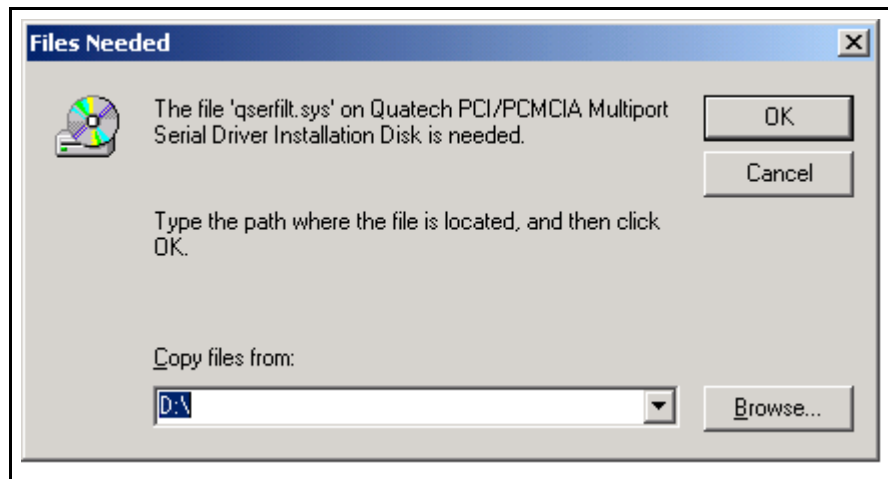
2. Window will locate the proper INF file and copy the file from the CD. Click the "Next" button.
3. The final dialog screen will verify the file copy from the CD. Click the "Finish" button.

## 4.2 Windows 2000

1. After inserting a QSC(LP)-200/300 for the first time, the "Add New Hardware Wizard will appear at start up. Click the "OK" button.



2. When the following dialog box appears, insert the Communications Driver CD (shipped with the device). Click the "OK" button.



3. The following dialog box will display the appropriate INF file on the CD in drive. Click the "OK" button.
4. Window will copy the INF file from the cd and display a final dialog indication that the process is complete. Click the "Finish" button.

### 4.3 Windows 98

1. After inserting a QSC(LP)-200/300 for the first time, the "Add New Hardware Wizard" will appear at start up. Click the "Next" button.
2. Select "Search for the best driver for you device". Click the "Next" button.



3. On the next dialog, select the "CD - ROM drive" check box. Insert the Communication Drivers CD (shipped with the device) into the CD - ROM drive. Click the "Next" button.



4. The following dialog box will display the appropriate INF file on the cd in drive. Click the "Next" button.
5. Window will copy the INF file from the cd and display a final dialog indication that the process is complete. Click the "Finish" button.

## 4.4 Windows 1995

Windows 95 maintains a registry of all known hardware installed in your computer. Inside this hardware registry Windows 95 keeps track of all of your system resources, such as I/O locations, IRQ levels, and DMA channels. The "Add New Hardware Wizard" utility in Windows 95 was designed to add new hardware and update this registry.

An "INF" configuration file is included with the QSC(LP)-200/300 to allow easy configuration in the Windows 95 environment. Also a custom Windows 95 serial device driver is included with the QSC(LP)-200/300 to support the use of the 16750 UART's 64 byte FIFO. Windows 95 uses the "INF" file to determine the system resources required by the QSC(LP)-200/300, searches for available resources to fill the boards requirements, and then updates the hardware registry with an entry that allocates these resources

The following instructions provide step-by-step instructions on installing the QSC(LP)-200/300 in Windows 95 using the "New Hardware Found" wizard.

1. After booting the computer with a newly-installed QSC(LP)-200/300, the "New Hardware Found" dialog box will appear. If you have never installed a Quatech PCI communications adapter before, the dialog box may simply indicate that it has found a "PCI Card."
2. Select the radio button for "Driver from disk provided by hardware manufacturer." Click the "OK" button to continue.
3. An "Install From Disk" dialog box should pop up. Insert the cd with the Quatech INF files on it, select the correct drive letter, and click the "OK" button. Windows 95 automatically browses the root directory for an INF file that defines configurations for Multi-function Adapters. If no INF files are found, click the "Browse" button and search the Win95 sub directory on the installation cd. You are not required to select the file name. After finding the directory containing the INF files, Windows 95 will choose the correct file.
4. The "New Hardware Found" dialog box will appear again, this time for an "Unknown Device."
5. Again select the radio button for "Driver from CD provided by hardware manufacturer." Click the "OK" button to continue.
6. Another "Install From CD" dialog box will pop up. The path should already be pointing to the Quatech CD. Click the "OK" button to continue.
7. You should now see the "Copying Files" dialog box as Windows 95 copies the driver files from the CD.
8. The installation utility will ask for your Windows 95 installation disks. Serial communication ports require two drivers supplied by Microsoft to function: SERIAL.VXD and SERIALUI.DLL. Insert the disk or CD and click "OK".

**NOTE:**

You may be able to skip this step if you are certain that your system has the latest version of these files installed. If you do not have your Windows 95 install disks immediately available, click "OK" anyway. A dialog box appears with an option to Skip the files. Click the Skip button and the files will not be installed. This is all right if the latest version of these drivers are currently in the  
\\WINDOWS\\SYSTEM directory.

9. The "New Hardware Found" dialog will repeat as each serial port is registered with Windows 95.
10. Installation is complete.

## **4.5 Windows NT**

The Windows NT device driver is installed by running the SETUP program. Up to 256 serial ports are supported. There is a command line-based configuration utility which is used for adding PCI bus and ISA bus serial ports. Please refer to the documentation included with the device driver for full installation and configuration details.



## 4.6 Viewing Resources with Device Manager

This discussion applies equally to Windows **95/98/ME** and **2000/XP**. Windows maintains a registry of all known hardware installed within the computer. Inside this hardware registry Windows keeps track of all the computer's resources, such as base I/O addresses, IRQ levels, and DMA channels. In the case of a **PCI plug-in card**, Windows configures the new hardware using free resources it finds within the hardware registry, and updates the registry automatically.

To view and/or edit hardware devices in Windows use the system **Device Manager**. Consult Windows on-line help for details on the use of the **Device Manager**.

The following instructions provide step-by-step instructions on viewing resources used by the QSC(LP)-200/300 in Windows using the "Device Manager" utility. Select Start|Help from within Windows for additional information on this utility.

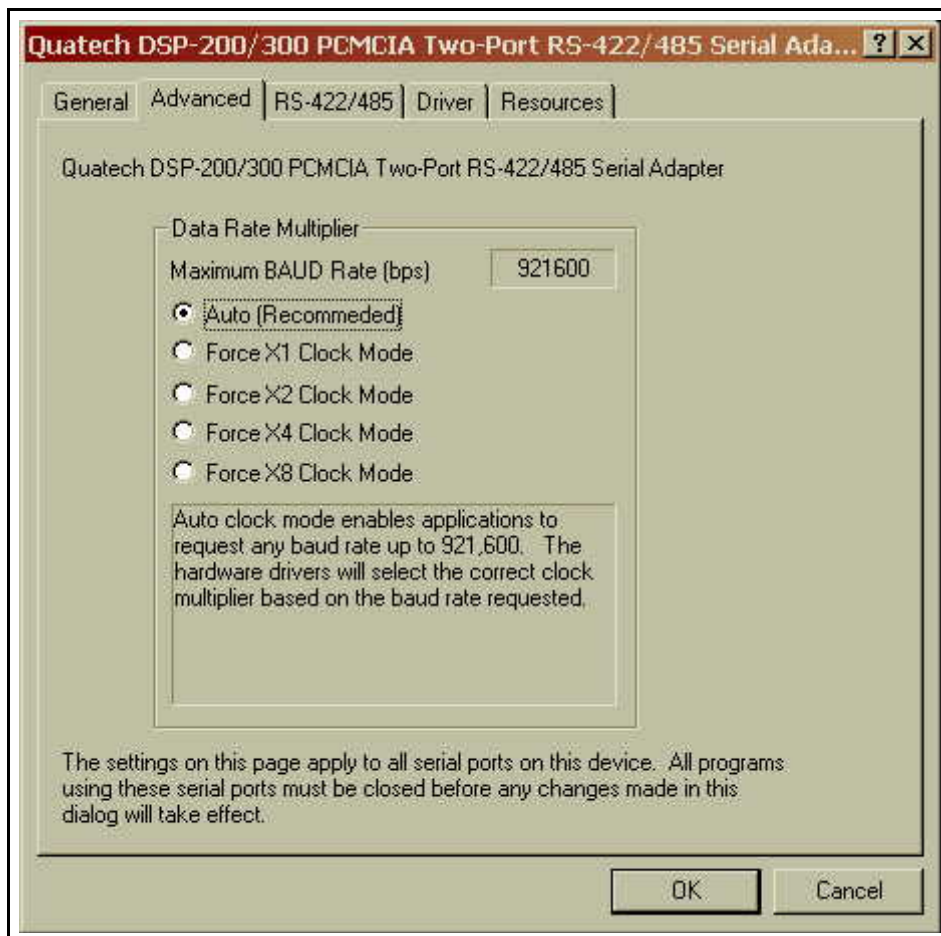
1. Double click the "System" icon inside the Control Panel folder. This opens up the System Properties box.
2. Click the "Device Manager" tab located along the top of the System Properties box. This lists all hardware devices registered inside the Windows registry. Additional information is available on any of these devices by right-clicking on the device name and then selecting "Properties" from the pop-up menu.
3. Double click the device group "Multi-function Adapters". The QSC(LP)-200/300 "parent device" belongs to this hardware class. The full device name for the QSC(LP)-200/300 is **Quatech QSC(LP)-200/300 PCI Four-Port RS-422/RS485 Serial Adapter**.
4. Double click the QSC(LP)-200/300 name and a properties dialog should open for the hardware adapter.
5. Click the "Resources" tab located along the top of the properties box to view the resources Windows has allocated for Input/Output Range and Interrupt Request. **Because PCI is a true plug-and-play bus, do not attempt to modify the configuration values listed.** Click "Cancel" to exit without making changes.
6. Double click the hardware class **Ports (Com and LPT)**. Each **Quatech PCI Serial Port** listed in this class is a "child device" of the QSC(LP)-200/300 "parent device." Windows 95 does not assign COM1-COM4 to ports addressed at nonstandard locations. So in Windows 95, the QSC(LP)-200/300 ports will be enumerated starting with COM5 (or higher) even if lower logical numbers are available.
7. Select any of the Quatech Serial Ports listed under the group Port (COM and LPT) and click the "Properties" button. This action opens a properties dialog for the specific COM port on the QSC(LP)-200/300. Then click the **Resources** tab to view the Input/Output

Range and Interrupt Request resource allocations. These will match those of the “parent device.” Click "Cancel" to exit without making changes.

8. Click the "Port Settings" tab and then click the "Advanced" button. The QSC(LP)-200/300 driver will display a custom Advanced Port Settings control, which allows the ports UART compatibility mode and FIFO threshold levels to be configured. The threshold values of full-scale for the transmit buffer and  $\frac{3}{4}$ -scale for the receive buffer are optimal for most applications. Note that the FIFO option for each of the QSC(LP)-200/300's four ports is configured independently.
9. Use the Logical COM Port names to access the serial ports on your QSC(LP)-200/300 through your software applications. Note: The Logical COM Port name is assigned to your ports by Windows. This name is required by Windows applications when accessing a particular port.

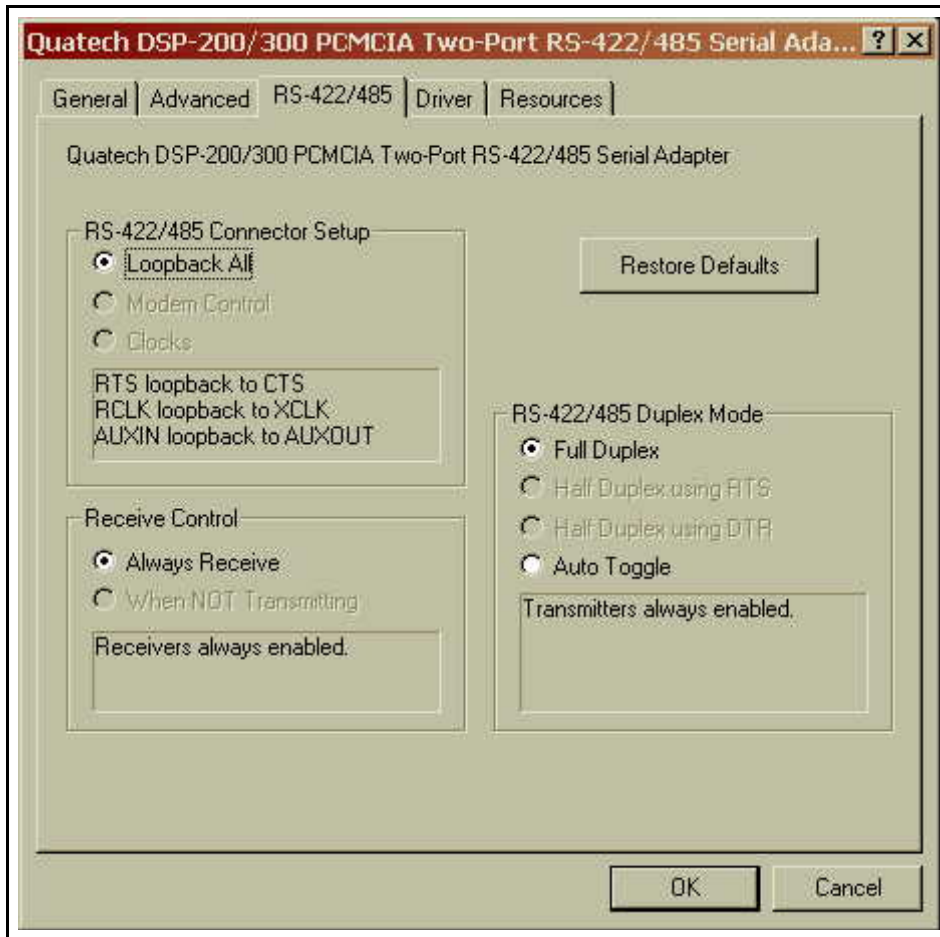
## 4.6.1 Changing Resource Settings with Device Manager

1. Start the Windows 95/98/ME **Device Manager**.
2. Double click on the hardware class **Multi-Port Serial Adapters** to list hardware devices in the class.
3. The QSC(LP)-200/300 “parent device” belongs to this hardware class. The full device name for the QSC(LP)-200/300 is **Quatech QSC(LP)-200/300: Four-Port RS-422/485 Serial Adapter**.
4. Open the **Properties** dialog for the QSC(LP)-200/300 device, then click the **Resources** tab to view the Input/Output Range and Interrupt Request resource allocations.
5. Open the **Properties** dialog for the QSC(LP)-200/300 device (Figure 12), then click the **Advanced** tab to view the clock rate settings.



Data Rate Multiplier		
Clock Mode	Max bps	Description
Auto	921,600	Auto clock mode enables applications to request any baud rate up to 921,600. The hardware drivers will select the correct clock multiplier based on the baud rate requested
X1	115,200	The X1 clock mode mimics a standard COM port. The hardware drivers lock the clock to the standard rate. The port will run at the baud rate requested by the application.
X2	230,400	The X2 clock mode locks the ports hardware clock at double the standard rate. The baud rate the port runs at will always be double the rate requested by the applications. This mode is useful for legacy applicattions which cannot request baud rates over 115,200
X4	460,800	The X4 clock mode locks the ports hardware clock at four times the standard rate. The baud rate the port runs at will always be four times the rate requested by the application. This mode is useful for legacy applications which cannot request baud rates over 115.200.
X8	921,600	The X8 clock mode locks the ports hardware clock at eight times the standard rate. The baud rate the port runs at will always be eight times the rate requested by the application. This mode is useful for legacy applications which cannot request baud rates over 115.200.

6. Double click the hardware class **Ports (Com and LPT)**. Each **Quatech PCI Serial Port** listed in this class is a “child device” of the QSC(LP)-200/300 “parent device.”
7. Open the **Properties** dialog for a COM port, then click the **RS-422/485** tab to view the settings for that port.



RS-422/485 Connector Setup	
Loopback All	RTS routed to CTS, AUXIN routed to AUXOUT, and TCLK routed to RCLK. Used when external handshaking or clocking signals are not available.
Modem Control	RTS routed to AUXOUT, AUXIN routed to CTS, and TCLK routed to RCLK. Used when RTS/CTS handshaking is required.
Clocks	RTS routed to CTS, AUXIN routed to RCLK, and TCLK routed to AUXOUT. Used to connect ports transmitting at different baud rates. In order to function, all ports must have and use this feature.
Receive Control	
Always Receive	Receivers are always enabled. In a Half Duplex mode, you will receive what you transmit (sometimes called echo).

When NOT Transmitting	Receivers are only enabled when not transmitting. In a Half Duplex mode, you will not receive what you transmit.
RS-422/485 Duplex Mode	
Full Duplex	Transmitters and receivers are always enabled; ports can send and receive simultaneously. Used in four-wire communication.
Half Duplex using RTS	RTS is set to enable the transmitters. Used in two-wire communication.
Half Duplex using DTR	DTR is set to enable the transmitters. Used in two-wire communication.
Auto Toggle	Hardware automatically enables the transmitters when transmitting. Transmitters will turn off three bit-times after the last stop bit of the last character, regardless of baud rate. Used in two-wire communication.

8. To summarize the RS-422/485 output drivers enable options: The QSC(LP)-200/300's ports may be configured for either full duplex or half duplex operation with this option. The default setting is the RS-422/485 ports are configured for full duplex operation with the RS-422/485 output drivers always enabled. In half duplex mode, the RS-422/485 transmitter may be enabled and disabled via the RTS (request to send) or DTR (data terminal ready) signals, or in auto-toggle mode, set to enable only when data is being transmitted. Both RTS and DTR are controlled through the Modem Control Register of the 16750.
9. Click the "Port Settings" tab and then click the "Advanced" button. The QSC(LP)-200/300 driver will display a custom Advanced Port Settings control, which allows the ports UART compatibility mode and FIFO threshold levels to be configured. The threshold values of full-scale for the transmit buffer and ¾-scale for the receive buffer are optimal for most applications. Note that the FIFO option for each of the QSC(LP)-200/300's four ports is configured independently.

## 5 Other Operating Systems

---

Device drivers for Windows NT and OS/2 are also available for the QSC(LP)-200/300. The board can be used under DOS and other operating systems as well in many circumstances. The software described below can be obtained from the Quatech web site if it did not come with the board.

### 5.1 Windows NT

The Windows NT device driver is installed by running the SETUP program. Up to 256 serial ports are supported. There is a command line-based configuration utility which is used for adding PCI bus and ISA bus serial ports. Please refer to the documentation included with the device driver for full installation and configuration details.

### 5.2 OS/2

The OS/2 device driver supports up to 32 serial ports in a system. Installation is a manual, but simple, process. Please refer to the documentation included with the device driver for full installation and configuration details.

### 5.3 DOS and other operating systems

The QSC(LP)-200/300 is not a direct drop-in replacement for a legacy serial port because its base address and IRQ cannot be fixed at values such as 3F8 hex, IRQ 4 (COM1) or 2F8 hex, IRQ 3 (COM2), etc. Rather, the system BIOS assigns the address and the IRQ in a plug-and-play fashion at boot time. Software which is to use the QSC(LP)-200/300 must be able to accommodate any valid assignments of these resources.

For Windows 95, Windows NT and OS/2, the Quatech device drivers determine what the resource assignments are and proceed accordingly. In other cases, however, the user must intervene. The discussion below will center on DOS, but the concepts can be applied to other operating systems as well.

Many DOS applications support user configuration of the base address and IRQ of a serial port. Such applications can generally make use of the QSC(LP)-200/300. Older applications, as well as some custom software, may use hard-coded standard legacy serial port addresses. These applications will require modifications to support PCI devices.

Custom applications for which the customer has source code can be modified to make just a few PCI BIOS function calls to obtain all the necessary configuration information. The PCI BIOS specification can be obtained from the PCI Special Interest Group. Contact Quatech technical support for more information.

### 5.3.1 QTPCI.EXE

Quatech's "QTPCI" utility supplies the information required when modifying the serial port settings of the application. This program should be run from real DOS, not in a Windows DOS box.

Figure 4 shows the Basic Mode display for the QSC(LP)-200/300 after the "Q" key has been pressed. In this example, the QSC(LP)-200/300 uses I/O base address FFA0 hex and IRQ 3. The hardware revision of the QSC(LP)-200/300 is also displayed. Pressing the "N" key will show similar information for all non-Quatech PCI devices in the system, including those devices integrated on the motherboard.

**The QTPCI program is capable only of displaying the PCI configuration. It cannot be used to make changes.**

```
Quatech PCI Configuration Information Display Software
Version 1.88

INSTRUCTIONS:
Press keys listed in the menu at the bottom of the screen.
This program only displays information. It cannot make changes.
Numbers preceded by "0x" are hexadecimal.

PCI BIOS detected, version 2.10

Quatech PCI adapters detected
DSC-200/300 Two-port RS-422/485 adapter          (Hardware Revision A1)
Uses IRQ 3
Base addr 1 = 0xffa0      I/O
-

Q - Quatech PCI adapters          M - Change to Expert Mode
N - Other PCI devices
X - EXIT
```

Figure 4 --- QTPCI.EXE Basic Mode display



Figure 5 shows the Expert Mode display for the QSC(LP)-200/300 after the "Q" key has been pressed. The information from the Basic Mode display is presented along with more details such as the Vendor and Device IDs, PCI Class Code, size of memory and I/O regions, etc. Pressing the "N" key will show similar information for all non-Quatech PCI devices in the system, including those devices integrated on the motherboard. In this example, the "Base addr 0" resource is reserved.

For users interested in even more details, PCI BIOS information can be displayed by pressing the "B" key. Pressing the "I" key displays the PCI interrupt routing table.

```

Quatech PCI Configuration Information Display Software
Version 1.00

Quatech PCI adapters detected

DSC-200/300 Two-port RS-422/485 adapter
Vendor ID 0x135c, Device ID 0x0030 found in slot 0x04 on bus 0x00
Device/Function code = 0x98, Revision ID = 0x01 (Hardware Revision #1)
PCI Class Code = 0x070200 Communications controller, multiport serial
Subsystem Vendor ID 0x135c, Subsystem ID 0x0030
INTR# mapped to IRQ 3 (route 0x61)
Base addr 0 = 0xfc00 I/O 0x00 bytes allocated
Base addr 1 = 0xffa0 I/O 0x10 bytes allocated

-

Q - Quatech PCI adapters          M - Change to Basic Mode
N - Other PCI devices            B - PCI BIOS details
X - EXIT                          I - Interrupt routing details

```

Figure 5 --- QTPCI.EXE Expert Mode display

## 6 External Connections

---

The QSC(LP)-200/300 provides four differential communication signals per channel. The two output signals are Transmit Data (TxD) and Auxiliary Output (AUXOUT). The two input signals are Receive Data (RxD) and Auxiliary Input (AUXIN). A ground signal is also provided.

The available input signals for AUXIN are Clear To Send (CTS) and the Receive Clock (RCLK). The available output signals for AUXOUT are Request To Send (RTS), the Transmit Clock (TCLK), and the AUXIN signal (for loopback). Either half-duplex or full-duplex operation can be selected for each communications channel. Auto-Toggle is also jumper selectable. If half-duplex operation is selected, one of the UART's signals (either DTR or RTS) is used to enable the transmitter drivers. The inverse of the transmitter enable can be used to enable the receiver drivers.

Configuration is usually done using Soft Select, accessible through Device Manager in Windows operating systems. Hardware overrides are available via jumper J1 for interface signal routing.

### 6.1 DTR/DSR or RTS/CTS Operation

The DTR or RTS modem control output of the UART can be used to enable and disable the transmit drivers. These options are selectable per channel. The factory default, with no jumpers across any of the pins in J1, is for both the drivers and receivers of both channels to be continuously enabled. . These option are not selectable via jumpers, they are only accessible through Device Manager under Window operating systems.

### 6.2 RTS/CTS Handshake

Transmission of RTS, combined with reception of CTS, allows for hardware handshaking (data flow control) between the UART and the external device. RTS is transmitted on AUXOUT and CTS is received on AUXIN by connecting a jumper across the “AUX” pins for the appropriate port of the jumper block J1. If RTS/CTS handshaking is not desired, the RTS output can be looped back to the CTS input by removing the any jumper from “AUX” pins for the appropriate port of the jumper block J1.

### 6.3 RCLK

This is the clock signal used by the receiver portion of the UART. It is generally provided by connecting it to the UART's own transmit clock output (TCLK). This signal can only be accessed via Soft Select through Device Manager. RCLK is affected by the “Loopback All”, “Modem Control”, or “Clocks” selections under “RS-422/485 connector set-up” on the RS-422/485 tab of each port's property dialog.

### 6.4 TCLK

This is the output clock signal used by the transmitter portion of the UART. It is generally connected to the UART's own receive clock input (RCLK). This signal can only be accessed via Soft Select through Device Manager. TCLK is affected by the “Loopback All”, “Modem

Control”, or “Clocks” selections under “RS-422/485 connector set-up” on the RS-422/485 tab of each port’s property dialog.

## 6.5 AUXIN/AUXOUT Loopback

The AUXIN signal is an input from the external device, and connecting it to the AUXOUT signal provides for a loopback mode of operation. In other words, whatever signal is transmitted by the external device over the AUXIN line will be fed back to the external device over the AUXOUT line. This mode is accomplished by default or by removing the jumper from the “AUX” pins for the appropriate port of the jumper block J1.

## 6.6 Half-Duplex/Full-Duplex/Auto-Toggle Selection

Using the hardware overrides provided by jumper block J1, the transmitters and receivers of each channel can be forced into Auto-Toggle mode. Additionally, operation in either half-duplex or full-duplex modes can be implemented via Soft Select, which is accessible via Device Manager under the Windows operating system.

The transmit drivers can be controlled by either the Data Terminal Ready (DTR) or the Request to Send (RTS) output from the UART. When disabled, the transmit drivers enter a high-impedance state. The receivers can be controlled by the inverse of the transmit enable. The drivers and receivers are always enabled in full-duplex mode.

### **WARNING:**

When operating in half-duplex mode, the transmitter drivers must be disabled before receiving any data. Failure to do so may result in multiple active output drivers being connected together, which may cause damage to the board, the computer, and the external device.

## 6.7 Termination Resistors

No termination resistors are provided on the ports. Both output and input signals are connected only to the external connector. Any termination which is required must be added externally.

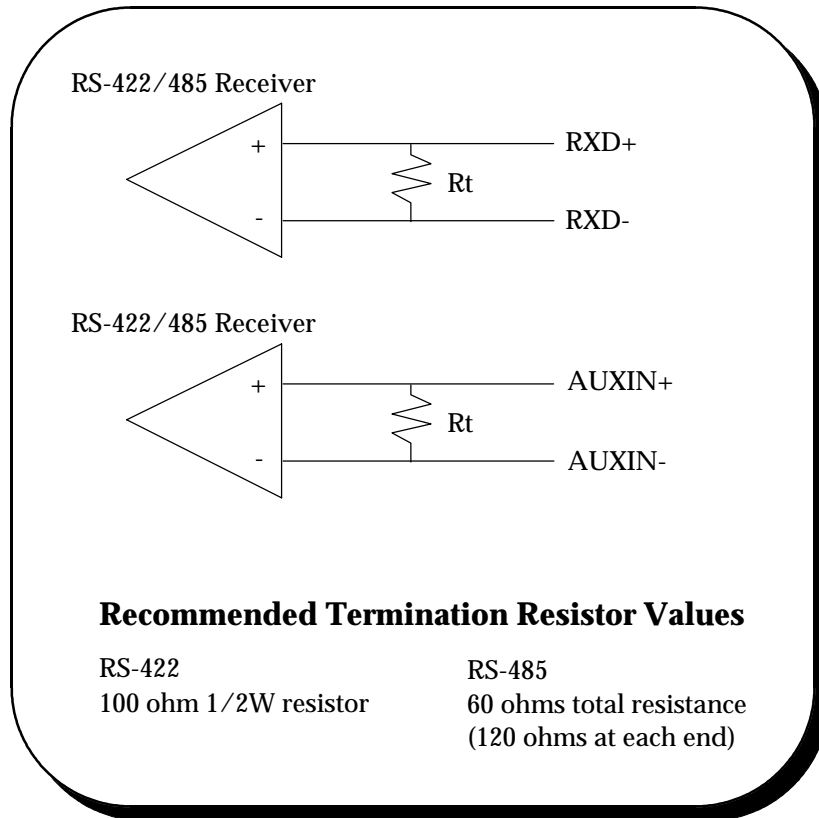


Figure 6. RS-422/485 Termination

## 6.8 RS-422/485 Peripheral Connection

The QSC(LP)-200/300 is a DTE device which connects to peripheral equipment through four female D-9 connectors. The onboard connector is a D-44 connector, which is brought out into four separate D-9 connectors via a custom cable assembly. The pin-out for the D-44 connector is listed in Figure 7. The serial port connections are listed in Figure 9.

Pin number	Signal description	Pin number	Signal description	Pin number	Signal description
1	nc	16	auxout3-	31	txd3+
2	gnd	17	rxd3+	32	rxd3-
3	txd3-	18	auxin3-	33	auxout3+
4	nc	19	auxin0+	34	nc
5	nc	20	auxout2-	35	txd2+
6	gnd	21	rxd2+	36	rxd2-
7	txd2-	22	auxin2-	37	auxout2+
8	auxin1+	23	auxout1-	38	nc
9	nc	24	rxd1+	39	txd1+
10	gnd	25	auxin1-	40	rxd1-
11	txd1-	26	auxin2+	41	auxout1+
12	nc	27	auxout0-	42	txd0+
13	gnd	28	rxd0+	43	rxd0-
14	txd0-	29	auxin0-	44	auxout0+
15	nc	30	auxin3+	X	

Figure 7. D-44 connector definitions

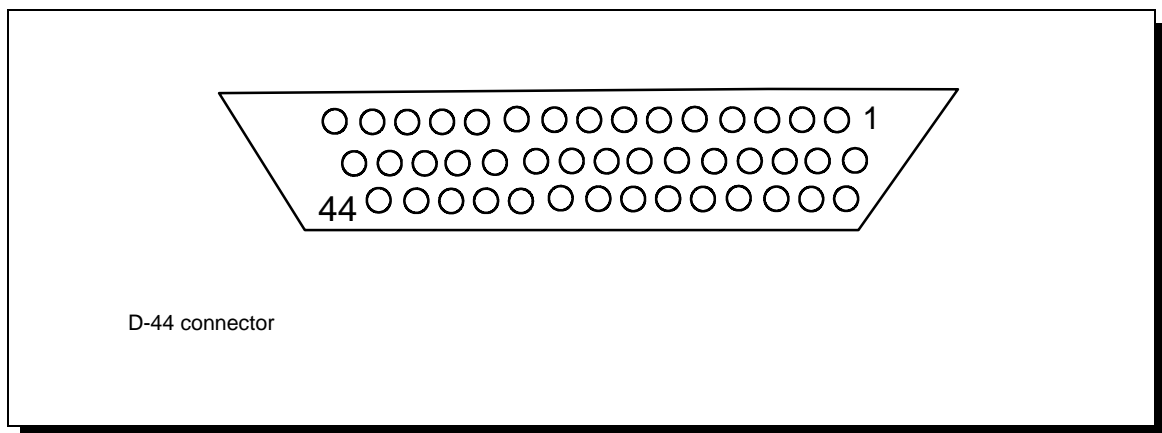


Figure 8. D-44 pin-out.

## 6.9 RS-422/485 Peripheral Connection

The QSC(LP)-200/300 connects to peripheral equipment through four male D-9 connectors. The serial port connector definitions are listed in Figure 10.

SignalDescription	D-9 Connector Pin
TxD+	2
TxD-	7
RxD+	4
RxD-	8
AUXOUT+	1
AUXOUT-	6
AUXIN+	5
AUXIN-	9
GND	3

Figure 9 --- QSC(LP)-200/300 connector definitions

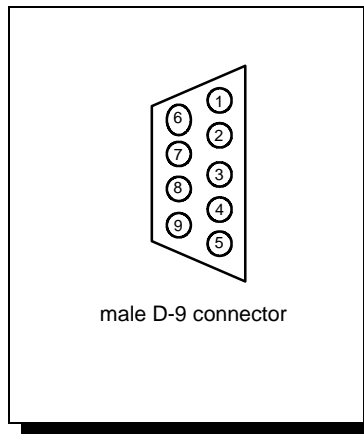


Figure 10 --- QSC(LP)-200/300 output connectors

## 7 PCI Resource Map

---

Listed below are the PCI resources used by the QSC(LP)-200/300. Such information may be of use to customers writing their own device drivers or other custom software. A detailed description of the QSC(LP)-200/300's UARTs is available on the Quatech web site.

(all numbers in hex)

PCI Vendor ID:      0x135C              Quatech, Inc.

PCI Device ID:      0x01A0              QSC(LP)-200/300

PCI Class Code

    Base class:      0x07              Simple communications controller

    Subclass:      0x02              Multiport serial controller

    Interface:      0x00

IRQ sourced by:      INTA#

### Base Address and Interrupt Level (IRQ)

The base address and IRQ used by the QSC(LP)-200/300 are determined by the BIOS or operating system. Each serial port uses 8 consecutive I/O locations. The four ports reside in a single block of I/O space in eight-byte increments, along with a sixteen-byte reserved region, for a total of 32 contiguous bytes, as shown in Figure 11.

Port	I/O Address Range
Serial 1	Base Address + 00 to Base Address + 07
Serial 2	Base Address + 08 to Base Address + 15
Serial 3	Base Address + 16 to Base Address + 23
Serial 4	Base Address + 24 to Base Address + 31

Figure 11. Serial Port I/O addresses

Both serial ports share the same IRQ. The QSC(LP)-200/300 signals a hardware interrupt when either port requires service. The interrupt signal is maintained until no port requires service. Interrupts are level-sensitive on the PCI bus.

The base address and IRQ are automatically detected by the device drivers Quatech supplies for various operating systems. For cases where no device driver is available, such as for operation under DOS, Quatech supplies the "QTPCI" DOS software utility for manually determining the resources used. See page 22 for details.

## 8 Specifications

---

Bus interface:	PCI, 32-bit bus, Universal Signalling Voltage IBM-compatible computers
Dimensions:	approx. 4.725" x 2.5"
Serial ports	
Controller:	16750 with 64-byte FIFOs
Interface:	Custom cable to four female D-9 connectors
Transceivers:	MAX-3076E or compatible
Differential output:	2V min. with 50-ohm load (RS-422) 1.5V min. with 27-ohm load (RS-485)
Output rise/fall time:	15ns max.
Differential input threshold:	-0.2V min., -0.05V max.
Input resistance:	96k ohm min..
Input current:	-100 microAmps min., +125 microAmps.
Power requirements	
+5 volts:	approx. 250 mA
Temperature:	operating 0° to 70° storage -50° to 80°
Humidity:	10% to 90%



## 9 Troubleshooting

---

Listed here are some common problems and frequent causes of those problems. If the information here does not provide a solution, contact Quatech technical support.

Any unauthorized repairs or modifications will void the QSC(LP)-200/300's warranty.

### **Computer will not boot up.**

1. Is the QSC(LP)-200/300 properly inserted? Remove the card and try again. Perhaps try a different expansion slot.
2. Ensure that an ISA-bus card is not using the same IRQ that the PCI BIOS tries to assign to the QSC(LP)-200/300. Most computers have BIOS setup options to reserve IRQs for either ISA or PCI use. Try reserving the IRQ for the ISA card. The BIOS will automatically choose a different IRQ for the QSC(LP)-200/300. An address conflict is unlikely because most PCI-based computers will assign I/O addresses in such a way that they cannot conflict with ISA-bus devices.
3. The QSC(LP)-200/300 may be defective. Contact technical support for instructions.

### **Cannot communicate with other equipment.**

1. Are the cable connections correct? Are the cables securely attached?
2. Is the software configured with the correct base address and IRQ information for the QSC(LP)-200/300? (This is mainly a DOS issue.)
3. Is the device driver installed?
4. If you are trying to communicate with another DTE, a null-modem cable will be required.
5. If possible, use a loopback connector to test the port. This connector needs to connect the following sets of signals on a D-9 connector:

TxD+ and RxD+ (pins 2 and 4)  
TxD- and RxD- (pins 7 and 8)  
AuxOut+ and AuxIn+ (pins 1 and 5)  
AuxOut- and AuxIn- (pins 6 and 9)

QSC(LP)-200/300  
User's Manual  
Revision 1.14  
November 2006  
940-0146-114